Atomic Energy Control Board
P.O. Box 1046
Ottawa, Canada
K1P 5S9

Commission de contrôle de l'énergie atomique
C.P. 1046
Ottawa, Canada
K1P 5S9

INFO-0346

REGULATION OF RADIATION SOURCES IN CANADA

by

W.R. Brown
Atomic Energy Control Board

Presented at
Argonne Labs Chicago
April 24, 1989

Canada

Paper

90-06864/

REGULATION OF RADIATION SOURCES IN CANADA

Paper presented at the AIEA International Training Course on Safety and Regulation of Sealed Sources of Radioactive Material, Argonne, Illinois, U.S.A., April 10-May 12, 1989.

ABSTRACT

This paper describes in general the Canadian program for the regulation of radiation sources, with particular emphasis on radioisotope licences. The Atomic Energy Control Board is described, as are the most significant parts of the Regulations. Licensing, which is the method chosen for control, is explained by describing the assessment of an application through to enforcement of the requirements, and the overall effectiveness of the program is measured by analyzing the incidents and overexposures that have occurred in recent years.

RÉSUMÉ

Le présent rapport décrit de façon générale le programme canadien de réglementation des sources de rayonnement, et notamment les permis de radio-isotopes. Il traite aussi de la Commission de contrôle de l'énergie atomique, ainsi que des parties les plus importantes de la réglementation. Il explique le régime de permis qui est la méthode de réglementation choisie en décrivant le processus d'évaluation de la demande jusqu'à l'application des exigences, puis mesure l'efficacité générale du programme en analysant les incidents et les surexpositions qui ont eu lieu au cours des dernières années.

REGULATION OF RADIATION SOURCES IN CANADA

W.R. BROWN
ATOMIC ENERGY CONTROL BOARD
P.O. BOX 1046
OTTAWA, CANADA
K1P-5S9

INTRODUCTION

The Atomic Energy Control Board (AECB) was established in 1946 by the Atomic Energy Control Act to control the development, application and use of nuclear energy in Canada, and to participate on behalf of Canada in international measures to control nuclear energy. The AECB achieves control through a comprehensive licensing system that covers all aspects of nuclear facilities and nuclear materials. This control also extends to the import and export of nuclear materials, and it involves Canadian participation in the activities of the International Atomic Energy Agency.

The goal of the AECB licensing system is to assure that nuclear facilities and materials are utilized with proper consideration of health, safety, security and protection of the environment. The system is administered with the co-operation of federal and provincial government departments in such areas as health, environment, transport and labour.

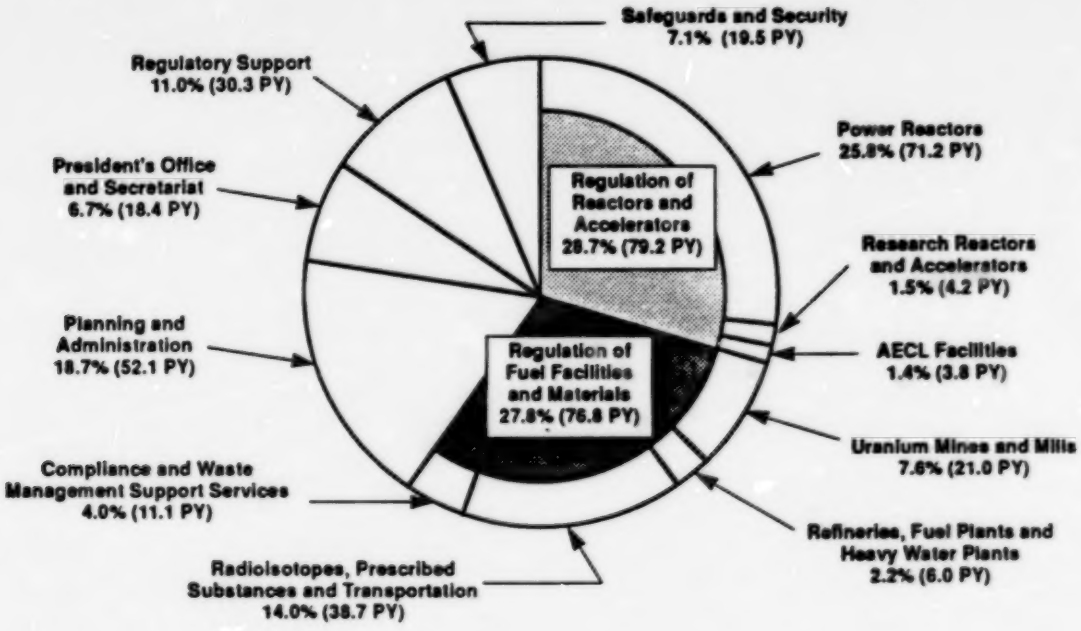
The AEC Regulations require that any person or organization wishing to produce, mine, refine, process, use, sell, or possess nuclear materials is required to obtain a licence from the AECB. Before issuing a licence, the AECB requires from a potential licensee, sufficient information to demonstrate that required health, safety, security and environmental protection standards will be met and maintained, and that any wastes will be managed in a satisfactory manner. In order to exercise its regulatory role, the AECB defines standards that must be met, assesses potential licensees' capabilities to maintain them and once a licence is issued, carries out compliance inspections to ensure that its requirements are continually met.

RESOURCES

The Atomic Energy Control Board consists of a full time President, an ex-officio member who is the President of the National Research Council and three other members, who are appointed by the government for two year terms which are usually extended several times. In 1987 for example, the Board had 6 meetings.

The staff of the Atomic Energy Control Board currently consists of 263 employees, 210 of which are located at the head office in Ottawa. In addition, 23 are located at nuclear power reactor sites, 5 at our laboratory, 10 at the Elliot Lake uranium mining area and 15 at our three regional compliance offices.

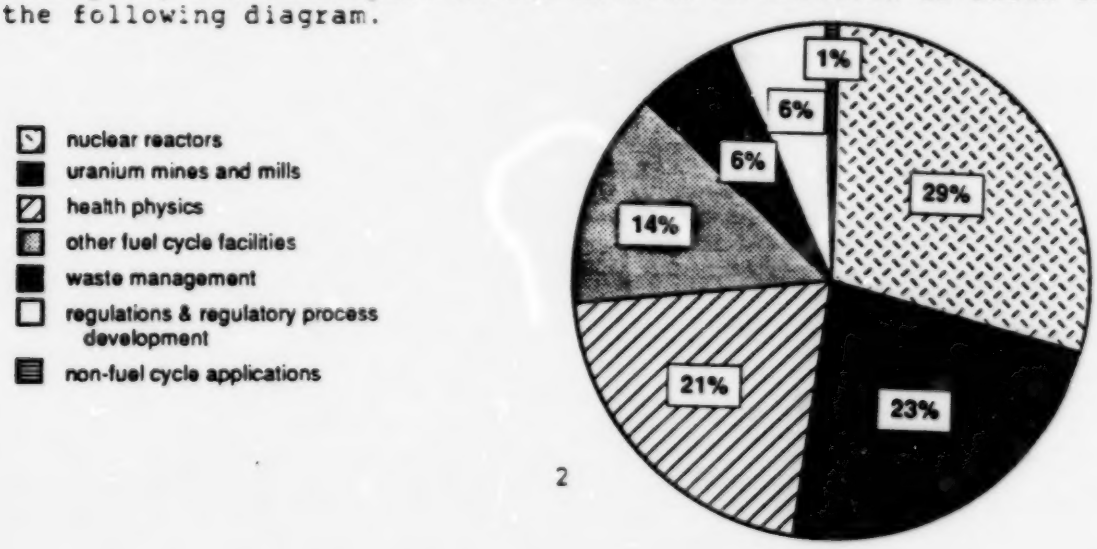
The distribution of staff effort is shown in the following figure.



REGULATORY RESEARCH

The AECB administers a research program to support its regulatory activities. The objective of the program is to produce pertinent information that will assist the AECB in making correct, timely and credible decisions with respect to its regulatory mandate and to augment the related research and development programs of the industries being regulated. Where appropriate, joint programs are undertaken with other government departments in order to obtain the maximum value for money expended and to benefit from liaison with other research organizations with similar interests.

Last year, the AECB spent $2.623 million on research as shown in the following diagram.



REGULATIONS

In the following sections, a brief summary of the Atomic Energy Control Regulations will be given. If precise details are needed, the regulations should be consulted for exact wording.

With the exception of industrial radiography which will be discussed later, the regulations do not deal with specific uses of radioactive material. Only general requirements are given so the licence is used to apply the conditions needed for the specific isotope, facility and use type. In addition, the regulations do not specify how a certain requirement will be achieved; the general requirements are given and the licensee is responsible to implement procedures to achieve them. If the licensee is unable to do this, a consultant can be used but it should be noted that the responsibility for compliance still remains with the licensee.

GENERAL

The basis of the AECB's regulatory control is stated in the AEC Act and is implemented via the AEC Regulations. All who operate nuclear facilities, or possess nuclear materials, must conform with the Regulations. Specifically, control is exercised over the following types of nuclear facilities:

- -power and research reactors
- -uranium mines and mills
- -uranium refining and conversion facilities
- -fuel fabrication facilities
- -heavy water plants
- -particle accelerators (above 10 Mev)
- -radioactive waste management facilities

The AECB also controls the use, sale and possession of the following types of nuclear materials:

- -prescribed substances and radioisotopes
- -devices or equipment containing radioactive materials

The Atomic Energy Control Regulations require anyone who uses, possesses, imports, exports or sells significant quantities of radioactive material to have a licence issued by the Atomic Energy Control Board. The following are some of the exemptions which apply. No licence is required if:

1) less than 10kg of uranium or thorium are involved (this does not apply to uranium 233 or 235)
2) the quantity of radioactive material in each source does not exceed a scheduled quantity and not more than 10 sources per year are involved. The scheduled quantities for common isotopes are listed in the regulations. Examples are:

cobalt 60	10 microcuries	(370 kBq)
radium 226	0.1 microcurie	(3.7 kBq)
cesium 137	10 microcuries	(370 kBq)
tritium	1 millicurie	(37 MBq)

3) the device does not contain more than 10 scheduled quantities of radioactive material and has been approved by the AECB

DOSE LIMITS

The regulations limit the doses that atomic radiation workers and members of the public may receive. When an atomic radiation worker, who is defined as someone who is likely to receive a dose in excess of any dose limit for members of the public, exceeds a dose limit, he or she is removed from work that could add significantly to their dose until the AECB approves a return to normal duties. The return requires a request from the person and is usually processed in several weeks, unless the person has exceeded twice a dose limit. In such cases, the AECB's medical advisor must be consulted. If the size of the dose is not known for certain, chromosome aberration studies may be performed, but the limit of detection is approximately 0.1 Sv to the whole body. For partial or extremity doses, such tests are of limited usefulness.

MAXIMUM PERMISSIBLE DOSES *

ORGAN	ATOMIC RADIATION WORKERS **		ANY OTHER PERSON
	REMS PER QUARTER	REMS PER YEAR	REMS PER YEAR
whole body gonads	3	5	0.5
bone,skin thyroid	15	30	3
extremities	38	75	7.5
any other single organ or tissue	8	15	1.5

* amendments to the Regulations are being prepared which would, among other things, make the maximum permissible doses consistent with ICRP 26. However, quarterly limits will remain.

** the dose to the abdomen of a pregnant woman shall not exceed 1 rem during the period after the pregnancy is known.

It should be noted that until a pregnancy is known, the dose limits for males and females are identical.

RECORDS

Every licensee is required to keep the records summarized below;

1) the form and quantity of radioactive material
2) full particulars of all disposals
3) the location of all radioactive materials
4) the doses of radiation received by any person as a result of the licensee's use of radioactive materials

REPORTS

Any person who is in possession of radioactive material or in charge of a device containing radioactive material is required to report to the AECB within 24 hours if any person received or is likely to have received a dose of ionizing radiation in excess of the regulatory limits.

SIGNS

The regulations require that any person in charge of an area, room or enclosure must mark it with a radiation warning sign if the dose rate exceeds 2.5 mR/h or it contains more than 100 scheduled quantities of radioactive material. In addition, any container which holds more than 1 scheduled quantity must also be marked.

RADIOGRAPHY

Since radiography is responsible for the largest number of incidents and overexposures, it is specifically covered by the regulations. In fact, radiography represents about 5% of AECB licences but 70% of significant radiation exposures. Control is very difficult because of the nature of the work which involves remote areas and adverse weather conditions.

The most significant aspect of the radiography regulations is the requirement for everyone to pass an AECB administered radiation safety exam before operating an exposure device (camera). This requirement was introduced in 1983 because experience had shown that the largest exposures were occurring to untrained operators while the experienced radiographer was in the dark room developing and interpreting film. It should be emphasized that this exam only covers radiation safety and not such subjects as developing or interpreting film.

Another aspect of the regulation is the sharing of responsibility between the qualified operator and the licensee. The qualified operator is legally responsible for wearing a thermoluminescent and direct reading dosimeter, using a survey meter after each exposure, locking the camera and ensuring that there are adequate signs and barriers to prevent people from entering the exposure area. The licensee is legally responsible for equipment maintenance, keeping specific records, limiting camera use to qualified operators and ensuring the qualified operator has sufficient safety equipment. Many requirements such as safety procedures and dose control are jointly shared because licensees can assign unrealistic production schedules which would make it impossible for the qualified operator to follow radiation safety procedures.

POWERS OF INSPECTORS

The regulations give each AECB inspector the right to enter any premises where radioactive materials are located. He or she may order remedial actions to correct deficiencies or an immediate halt to work with radioactive materials if a serious radiation hazard exists. However, these actions are not taken lightly because of the significant effect that these actions could have on a licensees operations.

ENFORCEMENT

In the case of serious violations of the Regulations or licence conditions, the AECB can suspend or revoke a licence following an opportunity to be heard by the Board, or the case may be taken to court where penalties up to $10,000 and 5 years in jail are possible. On average, three licensees have been prosecuted annually.

RADIOISOTOPE LICENCES

GENERAL

In this section, Radioistope licences will be discussed. They are by far the most numerous AECB licence but there are others issued for reactors,uranium mines, waste management, uranium mills and high energy accelerators.

As of August 1988, the breakdown of Radioisotope licences was as follows:

USE TYPE	NUMBER OF LICENCES
analyzers	247
bone densitometer	66
brachytherapy	46
calibration	618
consolidated (1)	37
chromatograph	417
dewpointers	127
gauges	938
human in vitro	428
human in vivo	249
irradiators	57
logging (2)	104
light sources	62
open sources (3)	334
other (4)	139
portable gauges (5)	521
radiography	182
smoke detectors (6)	8
static eliminators	604
suppliers	205
teletherapy	30
total	5419

(1) This category covers a single licence which authorizes various uses such as those found at universities
(2) Logging is a general term which is used to cover such activities as injecting radioactive materials or lowering sealed sources into oil wells
(3) Open sources describe uses where the radioactive material is not contained in a sealed capsule (ie. laboratories)
(4) This category covers all uses which are not described in the other categories. Examples are pacemakers,surge voltage protectors and tritium targets
(5) Most portable gauges measure the moisture and density of soils
(6) Smoke detectors are exempt from licensing if certain criteria are met. However, all suppliers or importers are licensed

LICENCE DETAILS

An example of a Radioisotope licence for a teletherapy facility is given in Appendix A; an explanation of each section follows.

1) Licensee
This is the legal name of the organization that has applied for the licence and is responsible for ensuring the radioactive material is used safely.

2) Period
This section specifies the start and expiry date of the licence. Normally, the period is limited to 2 years since many licensees move or go out of business; longer licence periods make investigation difficult.

3) Licensed Activity
This section is included to limit the licensee's activities to those approved by the AECB.

4) Radioactive Prescribed Substances
The isotopes and activities are limited by this section. For unsealed sources, the limit is in terms of the maximum amount of radioactive material the licensee will possess at any time during the licence period. No restrictions are placed upon the rate at which radioactive materials are purchased or used but the licensee must maintain records for at least 3 years. For sealed sources, the maximum activity and not the number of sources of each isotope is specified. Again, the licensee must maintain an inventory for inspection for at least 3 years.

5) Location
The location is specified to aid in making inspections and to limit the use to a given location if this is a factor in the licence approval. For example, teletherapy units can only be used in approved shielded rooms.

6) Conditions
Since the Regulations do not specify all the requirements for

the safe use of radioactive material, specific conditions are added to the licence. These are chosen for the specific licenced activity from a bank of approximately 400 conditions.

IMPORT AND EXPORT CONTROL

Without restrictions on the importation of radioactive materials, control would be impossible. Therefore, the AECB works in conjunction with the External Affairs Department to ensure that no one imports radioactive material without the approval of the AECB. This requires inspectors at each border crossing and port of entry but this system, which could not be justified for radioactive materials alone, already exists for numerous other factors such as taxes and prohibited agricultural products.

At the present time, countries importing radioactive material from Canada are not notified of the shipment, except in the case of fissile material. However, consideration is being given by the IAEA to an international notification system which would ensure importing countries are aware of all radioactive material entering their country.

APPLICATION ASSESSMENT

Before a licence is issued or renewed, an assessment is performed by the AECB to ensure that the specific use will not be an unacceptable hazard to staff, public or the environment. For new applicants, the review must be based upon the application but for renewals, the licensee's previous performance is also considered.

Since the risks associated with various uses of radioactive material differ significantly, the assessment efforts are not applied equally to the uses listed on page 6. For example, if a licensee has a good compliance record, the licence is renewed by a clerk if the use is for analyzers, calibration, chromatographs, dewpointers, gauges, light sources, portable gauges, static eliminators and minor suppliers. If the compliance record is poor or the use is for brachytherapy, consolidated, human in vivo, human in vitro, irradiators, logging, radiography, or teletherapy, an assessment is performed by a licensing officer. For this task, we currently have a staff of 6 who are aided by 5 clerks in the licence processing section. In addition, there is a transportation section of 5 people who approve Type B package designs.

RESOURCES

In order to perform effective assessments, it is necessary to have experienced licence assessment officers. For example, a summary of their practical experience is listed below:

1) a qualified radiographer who has worked in regulatory control for more than 15 years,
2) a chemical technologist with 10 years experience at a reactor

facility before joining the AECB,
3) a chemical technologist who had worked in an isotope production facility and as an isotope salesman prior to joining the AECB,
4) a pharmacologist and registered nuclear medicine technologist who has worked with radioactive materials in research and hospital nuclear medicine,
5) a registered nuclear medicine technologist who worked as a senior technician in a hospital nuclear medicine department,
6) a biochemist who had worked with a provincial radiation protection department.

STANDARDS

The second factor in performing effective assessments is standards and procedures. In general, the AECB adopts existing standards if they are available. For example, we use the American National Standard Institute (ANSI) recommendations for approval of fixed gauges and irradiators. For sources, we use the International Organization for Standardization (ISO) classifications and recommendations. We currently are actively involved in working groups of the ISO for radiography equipment and the IAEA for irradiator safety and establishment of effective regulatory programs. Canada has written standards for tritium iodine and uranium bioassay and facility ventilation systems.

The AECB has radioisotope standards for laboratory design and bioassay for people working with radioiodines. Standards for leak testing, radioisotope waste disposal, thyroid monitoring equipment, calibration and iridium 192 labelled (frac) sand use are in preparation.

CRITERIA

Due to the large variation in the uses and hazards of radioactive material, it is impossible to describe in detail the criteria for each use. Therefore, I will describe them in general but details for a teletherapy application will be given in the related paper specifically on this subject. (1)

The first factor is a recognized application. Approval is not given for frivolous uses or ones that have acceptable non-radioactive alternatives. Secondly, the doses which result for staff and the public must be less than the regulatory limits under normal and credible accident situations (ie. a risk - benefit assessment is made).

Radiation safety training is an important factor in the licence assessment. For the less hazardous uses such as static eliminators and gas chromatographs, we rely upon the information which is given by the supplier. At the other end of the spectrum, we have specific training requirements for uses such as nuclear medicine, gamma irradiators and radiography For the first two examples, we accept external standards but due to the importance

of radiography training, the AECB requires that anyone operating an exposure device must pass an AECB exam.

COMPLIANCE INSPECTIONS

A separate division has been established to inspect licensees to ensure that they are in compliance with the Regulations and licence conditions. Staff consists of 4 supervisors and 11 inspectors located in Calgary, Mississauga (Toronto area), Laval (Montreal area) and Ottawa. (see figure 1)

Following each inspection, a report is given to the licensee, usually at the time of the inspection but some are mailed within a few days if certain items must be checked at the office before finalizing the inspection. This external report is limited to a list of violations found. In addition, an internal report is written to the Radioisotope and Transportation Division, which describes the use of radioactive material, explains in detail the violations, compares the results with the previous inspection and assignes a grade (A= excellent, B= good, C= minor violations, D= serious violations). For "C" and "D" grades, the licensee is required to correct the deficiencies and notify the AECB of the remedial actions taken. For violations that represent a serious radiation hazard, the inspector may order immediate corrective actions or stop the use of radioactive material. During 1987, 730 of 2730 inspections were graded "C" or "D".

For each type of licence, a target inspection frequency has been established. The following table shows the target and actual inspection frequency for 1987. Requests for additional resources are in preparation so that, among other things, the AECB would be able to achieve the target inspection frequencies.

Radiography, the use type which results in the largest number of overexposures and incidents, also has the lowest number of inspections as a percentage of the target. This is caused primarily by the remote nature of the work, but steps have recently been taken to improve the situation. The Regulations allow the AECB to direct a radiography licensee to provide prior notification of all jobs and recently, approximately 10 each month have been so directed for a period of one week. A toll-free telephone number, which is connected to a tape recorder, allows the licensee to report jobs with the minimum of inconvenience and inspectors, using a special code, can interrogate the system from anywhere in Canada at any time. The licensees that are directed to notify the AECB, are chosen on the basis of of a computer program which analyzes recent inspection grades and the time since the last inspection. In addition, one inspection of the head office is scheduled each year to review records, procedures, doses and storage conditions.

INSPECTION FREQUENCIES

Use Type	Target (freq/year)	Target (insp/year)	Actual (insp/year)	% of target
analyzer	0.5	115	92	80
bone density	0.5	33	33	100
brachytherapy	1	44	28	64
calibration	0.5	304	336	111
consolidated	1	37	35	93
chromatograph	0.5	197	160	84
dewpointer	0.25	30	39	130
gauges	0.5	462	382	83
in vitro	1	415	227	55
in vivo	1	240	163	68
irradiator	1	54	29	54
logging	2	204	108	53
light sources	0.25	16	22	138
open sources	1	327	150	46
other	1	103	41	40
portable gauge	1	506	307	61
radiography	3	570	164	29
smoke detector	1	7	4	57
static elim.	0.25	202	265	131
supplier	1	212	118	56
surge tubes	0.25	3	4	133
tritium target	0.5	6	11	183
teletherapy	1	30	12	40
total		4117	2730	67

ENFORCEMENT

Since 1980, there have been 23 prosecutions proposed by the AECB. Fourteen have been successful, two were lost and nine are pending. The number of prosecutions has been increasing as can be seen by the number which are currently pending. The average fine has been $800 but this does not include the licensee's legal fees and in some cases, the adverse publicity has been much more significant than the fine itself.

The AECB has the authority to revoke a licence for serious violations. This is normally done only for licensees that have a history of non-compliance after all other options have been exhausted, because this action could have the effect of putting a number of people out of work. In such cases, the licensee may appeal to the five member Board for reversal or modification of the revocation.

The AECB has recognized that prosecutions are not an efficient method to force compliance. A fine system, in addition to the current methods, is under serious consideration.

TRANSPORTATION

In addition to licensing users, the AECB also has a Transportation Section with a staff of 5, who are responsible for the packaging and safe transport of radioactive materials (see figure 2). The Canadian regulations are based on IAEA Safety Series 6 (2) with some restrictions. One significant difference is that Canada does not fully accept the universality of the Type B(U) concept in that all foreign Type B and fissile packages entering Canada, require approval in the form of a Canadian endorsement.

The regulatory control for transport in Canada is shared between the AECB and Transport Canada, Transport of Dangerous Goods Directorate, through the Transport of Dangerous Goods Regulations. In essence, Transport Canada is responsible for all carrier aspects while the AECB is responsible for packaging, preparation for shipment and receipt after shipment.

The primary duties of the Transportation Section are as follows:

1] To assess all applications for Type B and fissile packages from both Canadian and foreign applicants and to issue Canadian certifications and endorsements for those packages which meet the regulations.

2] To review requests for transport of non-conforming packages. If the need can be justified and an equivalent level of safety demonstrated, a "Special Arrangement Certificate" is issued.

3] To draft the required Canadian regulations.

4] To advise Transport Canada and modal authorities (air, rail, ship), as required.

5] To participate in the drafting of IAEA regulations and advisory documents.

6] To provide advice to carriers, shippers and the general public on regulatory requirements.

7] To monitor the shipment of all radioactive materials. On a random basis, or when there are any doubts, review documentation that is required to demonstrate conformity with the Type A requirements.

8] To provide technical advice to the Radioisotope Section on the acceptability of devices containing radioactive materials. This involves performing engineering analyses and ensuring devices can be shipped in accordance with the regulations.

9] To provide advice in emergency situations during the transport of packages.

PERFORMANCE CRITERIA

The AECB is interested in establishing performance criteria for their regulatory program in order to identify trends and areas which may require more resources or to continue justifying the current level of funding. This is a difficult task for any regulatory program but the number of overexposures is a good indicator since the goal of any such program is to reduce radiation doses. However, interpretation is necessary because other factors, such as the general health of the economy, can reduce the number of overexposures during recessionary periods.

OVEREXPOSURES BY YEAR

YEAR	NUMBER PER YEAR	AVERAGE ANNUAL WHOLE BODY DOSE (OVEREXPOSURES) (mSv)	LARGEST DOSE (mSv)	PERCENT FROM RADIOGRAPHY
1980	10	278	800	80
1981	19	68	160	100
1982	7	77	120	50
1983	7	79	145	83
1984	20	123	440	58
1985	12	95	200	64
1986	23	62	104	81
1987	13	60	90	64

From the above table, it can be seen that the average and maximum doses for whole body annual overexposures, has decreased during the last few years. It is thought that this is due to more inspections, improved training and the stringent requirements of the radiography qualified operator exam.

Transportation is another area where it should be possible to judge performance. The following table lists the number of transport occurrences in past years. However, even with increased compliance, the numbers haven't decreased but it is suspected that this is partially due to an increased percentage of incidents being reported.

TRANSPORTATION INCIDENTS PER YEAR

YEAR	NUMBER OF OCCURRENCES
1984	16
1985	21
1986	27
1987	21

RADIOISOTOPE INCIDENTS PER YEAR

USE TYPE	1983	1984	1985	1986	1987
analyzer			2	3	3
brachytherapy		1	3	2	
consolidated	4			3	2
chromatograph		1	1		
dewpointer	1				
gauges	4	9	3	6	3
laboratory			3		
in vivo	2	3	6	6	1
logging	2	7	8	4	11
light sources			1		
other	3		3	2	2
portable gauges	2	7	12	11	15
radiography	10	21	30	23	12
static eliminator	3	2	10	18	17
supplier		1		1	1
teletherapy	2	1	2	3	
total	33	53	84	82	67

REFERENCES

[1] Brown W.R. "A Radiation Safety Program For Teletherapy Facilities", Atomic Energy Control Board, P.O. Box 1046, Ottawa, Canada, K1P-5S9.

[2] International Atomic Energy Agency, "Regulations for the Safe Transport of Radioactive Material", Safety Series 6, 1985 Edition, Vienna, 1985.

I) LICENSEE

The Atomic Energy Control Board issues this licence to:

hereinafter 'the licensee'.

II) PERIOD

This licence is issued for the period of 01/06/87 to 31/05/89.

III) LICENSED ACTIVITY

This licence is issued for the possession and importation of the radioactive prescribed substance or the device containing the radioactive prescribed substance described in Section IV for :

teletherapy

IV) RADIOACTIVE PRESCRIBED SUBSTANCE

ITEM	DESCRIPTION	POSSESSION LIMIT OPEN SOURCES	MAXIMUM ACTIVITY SEALED SOURCES	TYPE OF DEVICE
1	Cobalt 60	n/a	280 terabecquerels	AECL Eldorado 78
2	Cobalt 60	n/a	275 terabecquerels	AECL Theratron 780
3	Depleted Uranium	n/a	Unlimited	Contained as an integral part of a device listed above and shielding in Therac 6

When a device is listed opposite a radioactive prescribed substance, the said radioactive prescribed substance is to be used only in that device.

The amount of radioactivity for the radioactive prescribed substance referred to in each item is limited to the maximum activity per device or the possession limit in accordance with the provisions of the table.

V) LOCATION

Subject to the conditions of this licence, the radioactive prescribed substance(s) may be

used or stored at

VI) CONDITIONS

The licensee shall comply with the following conditions:

1. Each teletherapy room shall be equipped with an audible alarm which will sound when the door is open and the source is unshielded.

2. Leak tests capable of detecting the presence of 0.2 kilobecquerel of a radioactive prescribed substance shall be performed on each sealed source at least once every 12 months and after any incident which could result in source damage. Records shall be maintained for at least 3 years. If removable contamination in excess of 0.2 kilobecquerel is detected, the device shall be immediately removed from service and the Atomic Energy Control Board shall be notified.

3. Any modification of the safety interlocks or of the device containing the radioactive prescribed substance is prohibited without prior approval in writing from the Atomic Energy Control Board.

4. This licence, or a copy thereof, shall be conspicuously posted in all locations listed in Section V of this licence.

5. An inventory of all radioactive prescribed substances shall be maintained and made available to the Atomic Energy Control Board upon request. The inventory shall include the location of all radioactive prescribed substances.

6. The licensee shall ensure that any person working with a radioactive prescribed substance is provided with a personal thermoluminescent dosimeter (TLD) which is designed to measure radiation dose to the person's whole body and is supplied by an agency approved by the Atomic Energy Control Board. The dosimeter shall be sent to the agency for measurement at least quarterly.

7. All areas around the exposure room shall be surveyed at least everytime the sealed source is changed. Using the results of these surveys, procedures shall be laid down to ensure that non-atomic radiation workers and atomic radiation workers do not receive more than 100 microsieverts per week and 1 millisievert per week respectively.

8. The door leading to the exposure room shall be interlocked with the source shutter mechanism so that it will not be possible to enter the room with the source in the exposed position or expose the source with the door open. It shall not be possible to lock someone in the exposure room.

9. Any equipment malfunction which could adversely affect radiation safety shall be reported to the Atomic Energy Control Board within 24 hours.

10. Where the licensee becomes aware of a dosimetry result for a person exceeding the limits specified in Schedule II of the Atomic Energy Control Regulations for that person, the licensee shall forthwith inform the Board and the person of the result and shall investigate the cause and circumstances contributing to the result.

11. The licensee shall not transfer any radioactive prescribed substances procured under the authority of this licence to any person who is prohibited pursuant to the Atomic Energy Control Regulations from possessing such radioactive prescribed substances.

12. Radioactive prescribed substances, whose use and possession is authorized by this licence, shall be used in accordance with the instructions provided by the manufacturer, except in the event that these instructions conflict with the Atomic Energy Control Regulations or the terms or conditions of this licence, in which case the latter shall be complied with.

13. Only persons instructed in the operation of the device containing a radioactive prescribed substance and emergency procedures shall be authorized by the licensee to use the equipment.

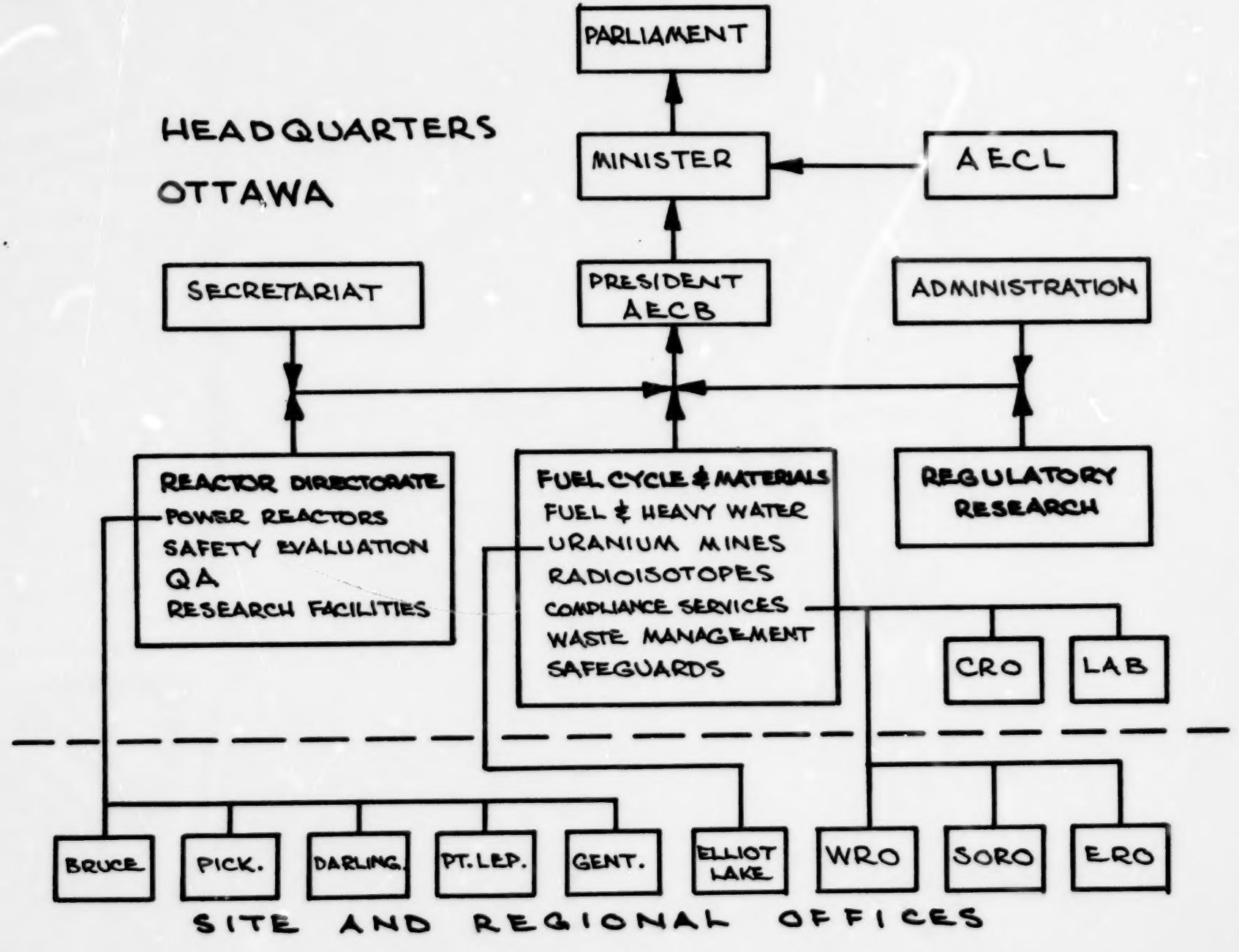
14. Subject to any other condition of this licence respecting the disposal of specific radioactive prescribed substances, all radioactive prescribed substances shall be disposed of by being:
1) returned to the supplier after making prior arrangements or
2) sent to Atomic Energy of Canada Limited after making prior arrangements or
3) sent, after making prior arrangements, to a facility possessing an appropriate Waste Facility Operating Licence (WFOL) issued by the Atomic Energy Control Board.
Any other waste disposal method will require specific written approval of the Atomic Energy Control Board.

15. The licensee shall ensure that in vivo procedures are under the supervision of a medical practitioner appropriately qualified to use radioactive prescribed substances in or on humans.

16. Packaging of a radioactive prescribed substance shall be in accordance with the Transport Packaging of Radioactive Materials Regulations.

ATOMIC ENERGY CONTROL BOARD

BY _____
W.R. Brown, Manager
Radioisotopes and
Transportation Division


HEADQUARTERS
OTTAWA
PARLIAMENT
MINISTER
AECL
SECRETARIAT
PRESIDENT AECB
ADMINISTRATION
REACTOR DIRECTORATE
POWER REACTORS
SAFETY EVALUATION
QA
RESEARCH FACILITIES
FUEL CYCLE & MATERIALS
FUEL & HEAVY WATER
URANIUM MINES
RADIOISOTOPES
COMPLIANCE SERVICES
WASTE MANAGEMENT
SAFEGUARDS
REGULATORY RESEARCH
CRO
LAB
BRUCE
PICK.
DARLING.
PT. LEP.
GENT.
ELLIOT LAKE
WRO
SORO
ERO
SITE AND REGIONAL OFFICES

ATOMIC ENERGY CONTROL REGULATIONS

- LICENSING - OBLIGATIONS, EXEMPTIONS, APPLICATIONS, CONDITIONS.
- RECORDS
- INSPECTORS - POWERS
- ATOMIC RADIATION WORKERS
- INDUSTRIAL RADIOGRAPHY
- PERMISSIBLE DOSES - OBLIGATIONS
- REPORTING OCCURRENCES
- SIGNS
- PRECAUTIONS
- DISPOSAL
- REVOCATION, SUSPENSION, AMENDMENT

TRANSPORT PACKAGING OF RADIOACTIVE MATERIALS REGULATIONS

Atomic Energy Control Board / Commission de contrôle de l'énergie atomique

MAXIMUM PERMISSIBLE DOSES

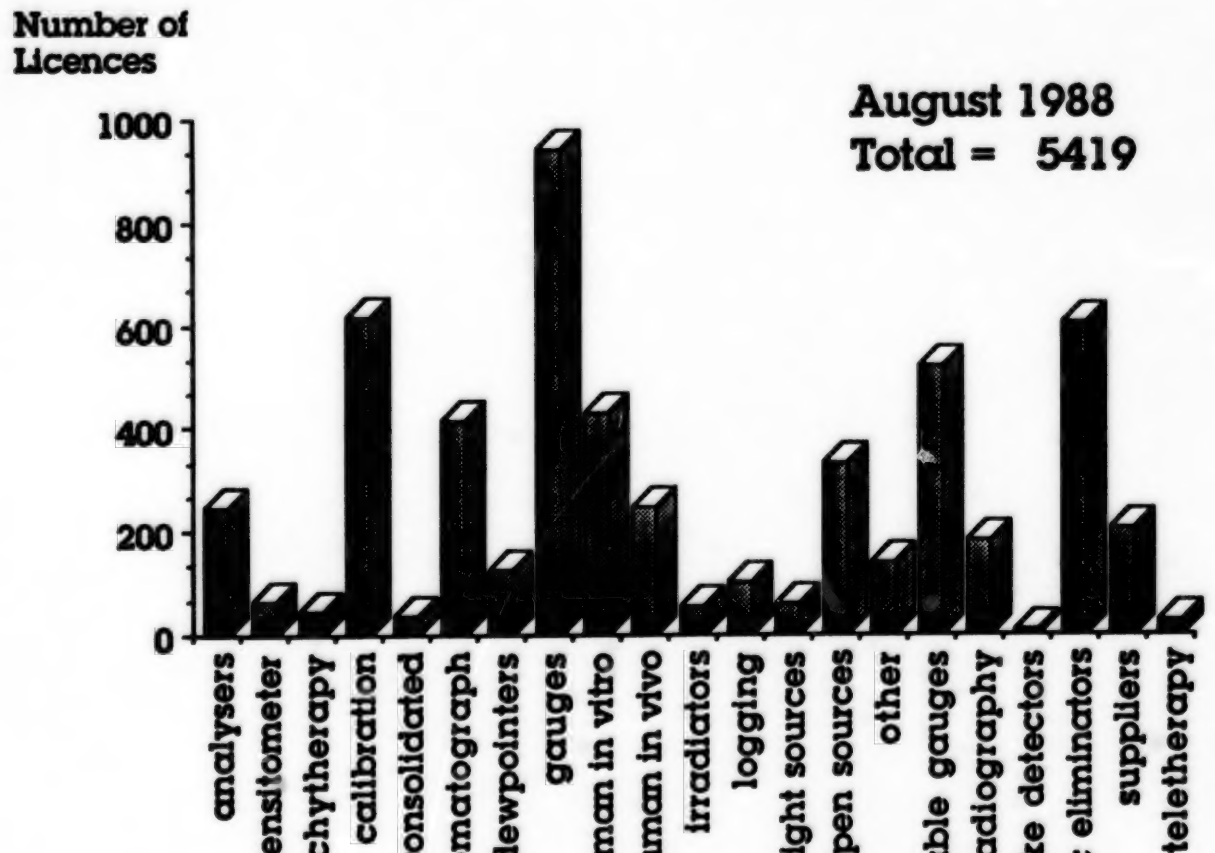
COLUMN I	COLUMN II		COLUMN III
	ARWS		ANY OTHER PERSON
ORGAN OR TISSUE	REMS PER QUARTER	REMS PER YEAR	REMS PER YEAR
WHOLE BODY	3(1)	5(1)	0.5
BONE, SKIN, THYROID	15	30	3(2)
EXTREMITIES	38	75	7.5
OTHER ORGANS	8	15	1.5

(1) THE DOSE TO THE ABDOMEN OF A PREGNANT ATOMIC RADIATION WORKER AFTER THE LICENSEE IS INFORMED OF THE PREGNANCY OF THAT WORKER SHALL NOT EXCEED A TOTAL OF 1 REM, ACCUMULATED AT A RATE OF NOT MORE THAN 0.06 REM PER TWO WEEKS.

(2) THE DOSE TO THE THYROID OF A PERSON UNDER THE AGE OF 16 YEARS SHALL NOT EXCEED 1.5 REMS PER YEAR.

Atomic Energy Control Board | Commission de contrôle de l'énergie atomique

Radioisotope Licences



LICENSING PROCESS

APPLICATION

REVIEW AND ASSESSMENT

ISSUE

COMPLIANCE INSPECTION

RADIOISOTOPE LICENCE

I) LICENSEE	LEGAL ENTITY
II) PERIOD	2 YEARS
III) PURPOSE	POSSESSION IMPORTATION APPROVED USE
IV) RADIOISOTOPES	RADIOISOTOPE POSSESSION LIMIT - OPEN SOURCES MAXIMUM ACTIVITY - SEALED SOURCES DEVICE
V) LOCATION	USE LOCATION VARIABLE STORAGE
VI) CONDITIONS	PROCEDURES RESTRICTIONS STORAGE SIGNS LEAK TESTS CONTAMINATION CONTROL DOSIMETRY REPORTS TRAINING TRANSPORTATION DISPOSAL

COMPLIANCE INSPECTIONS

POSSESSION LIMITS

PLACES OF USE

INVENTORIES AND RECORDS

CONTAMINATION CONTROL

PERFORM SURVEYS

VERIFY COMPLIANCE WITH ALL LICENCE CONDITIONS AND A.E.C. REGULATIONS

HOSPITALS AND LABS SHOULD BE INSPECTED ONCE PER YEAR

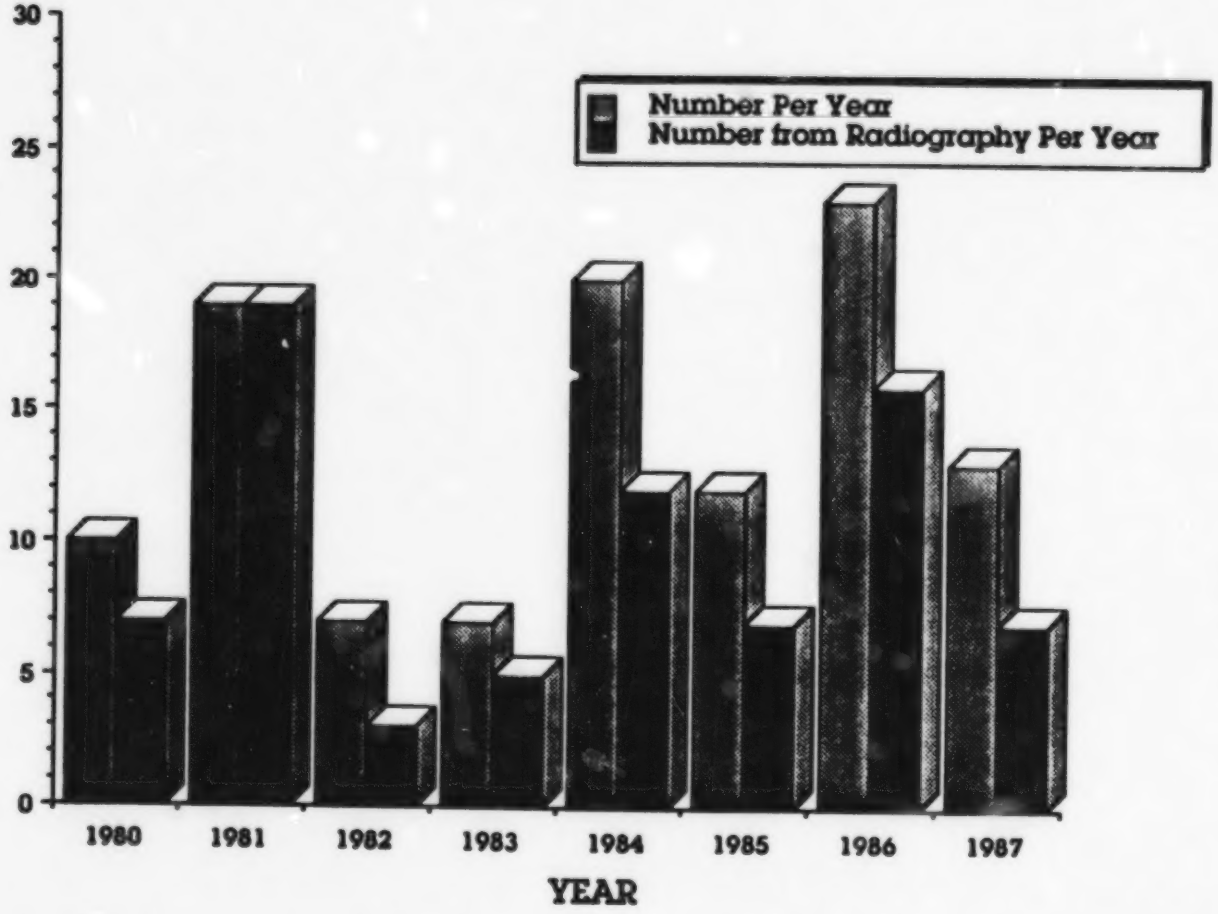
INSPECTION REPORT GIVEN TO THE CONTACT PERSON WITH A COPY TO R.T.D.

Atomic Energy Control Board | Commission de contrôle de l'énergie atomique

INSPECTION FREQUENCIES

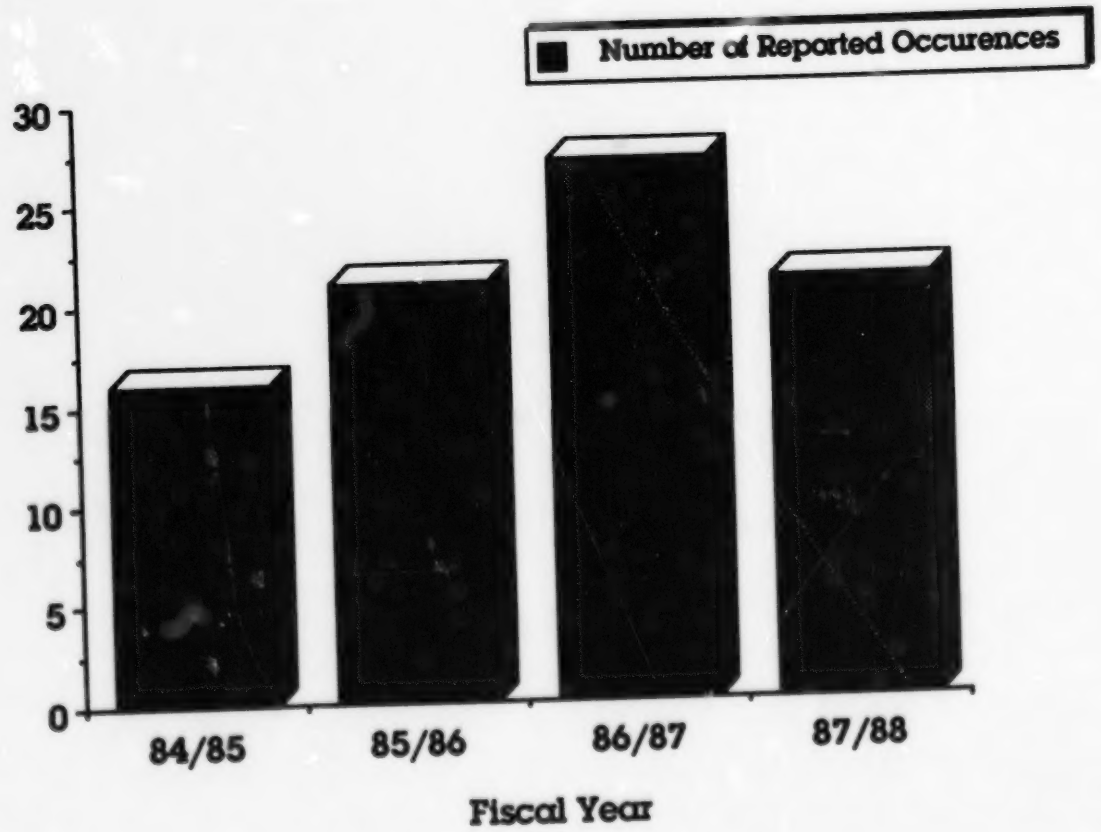
Atomic Energy Control Board | Commission de contrôle de l'énergie atomique

OVEREXPOSURES PER YEAR



Atomic Energy Control Board | Commission de contrôle de l'énergie atomique

TRANSPORTATION OCCURENCES



Atomic Energy Control Board | Commission de contrôle de l'énergie atomique

INCIDENTS BY USE TYPE (1983 - 1988)